UNITED STATES MARINE CORPS
Logistics Operations School
Marine Corps Combat Service Support Schools
Training Command
PSC Box 20041
Camp Lejeune, North Carolina 28542-0041

AOM 6303

STUDENT OUTLINE

FASTENING HARDWARE

LEARNING OBJECTIVES

1. TERMINAL LEARNING OBJECTIVES:

a. Given a student handout entitled "Fastening Hardware" and list containing the names, grade designators, and illustrations of various types of threaded fasteners, match the fastener name or grade designation to the correct illustration to identify the types of fasteners used in automotive applications, per information contained in the reference. (6.3.3)

b. Given a student handout entitled "Fastening Hardware," damaged threaded fastener, tools and equipment, repair the fastener, per information contained in the reference. (6.3.4)

2. ENABLING LEARNING OBJECTIVES:

a. Given a student handout entitled "Fastening Hardware" and list containing the names and illustrations of four threaded fasteners, match each illustrated fastener to its name, per information contained in the reference. (6.3.3a)

b. Given a student handout entitled "Fastening Hardware" and list containing the grade designators and illustrations of three threaded fasteners, match each illustrated fasterner to its grade designation, per information contained in the reference. (6.3.3b)

c. Given a student handout entitled "Fastening Hardware," select descriptive statements from lists provided to explain the intended application of three fasteners, per information contained in the reference. (6.3.3c)

d. Given a student handout entitled "Fastening Hardware," fastener with damaged internal threads, tools and equipment, restore the damaged threads, per information contained in the reference. (6.3.4a)

e. Given a student handout entitled "Fastening Hardware," fastener with damaged external threads, tools and equipment, repair the damaged threads, per information contained in the reference. (6.3.4b)

NOTES:

1. This lesson identifies the Fastening Hardware used in automotive applications. The ability to correctly select and use the fasteners is progressively developed through participation in the numerous practical application exercises that are conducted in the course.

2. The student handout contains a compendium of information relative to Fastening Hardware that has been extracted from approved technical publications.

3. This lesson includes thirty minutes of performance testing conducted concurrently with a portion of the practical application training within the lesson.

1. INTRODUCTION

a. Fasteners come in a variety of materials, shapes, sizes and styles.

b. Fasteners have a specific function.

c. It is important to select the proper fasteners.

d. Fasteners are identified by:

(1) Type.

(2) Size.

(3) Threads.

(4) Grade.

(5) Torque values.

2. IDENTIFICATION OF THREADED FASTENERS

HEAD STYLES

Round Head — Pan Head — Socket Head

Flat Head — Oval Head — Hex Head

Truss Head — Fillister Head — Square Head

CAP SCREWS

Capscrews pass through the part to be clamped and are threaded into a second part.

MACHINE SCREWS

Machine screws pass through the part to be clamped and are threaded into a second part.

Truss — Oval — Flat — Pan — Fillister — Hex

SET SCREWS

Set screws are used to lock gears, pulleys, and shafts in place.

Cone Point — Cup Point — Dog Point

LAG SCREWS

Lag screws have threads designed to cut their own threads into wood and similar material. They can be used in conjunction with an anchor to clamp machinery to concrete.

Hex Head

Square Head

SHEET METAL SCREWS

Sheet Metal screws are designed to thread themselves into sheet metal and clamp parts tightly together.

Pan Head

Flat Head Phillips

BOLTS

Bolts are used to clamp together parts that are not threaded.

Hex Head Bolt

Stove Bolt

Carriage Bolt

Plow Bolt

STUDS

Coarse

Fine

Continuous

Coarse

Coarse

NUTS

Hex Square Jam
Pall

Slotted Castellated Stover
Nylon

Lock

3. MEASURING THREADED FASTENERS

   a. Diameter of threads.

   b. Length.

   c. Head style.

   d. Numbered sizes.

   e. Metric sizes.

4. THREAD TYPES

   a. Threads per inch.

   b. Pitch.

   c. Thread Series.

      (1) Unified National Fine (SAE).

      (2) Unified National Coarse (USS).

      (3) Metric.

5. GRADES

   a. Society of Automotive Engineers.

Grade 2 Grade 5 Grade 8
Stainless Steel

b. Metric.

6. INDUSTRIAL ACCEPTED SEQUENCE FOR DESCRIBING THREADED FASTENERS

When asking for a bolt give the diameter, followed by the number of threads per inch, length, grade and style. Say: "I need a 1/2 by 13 by 3, grade 5, hex head bolt."

When asking for machine screws say: "I need a 6-32 by 2, pan head machine screw." Give the number that represents the diameter first, followed by the number of threads per inch, length and style.

When asking for a lag screw say: "I need a 1/4 by 4, hex head lag screw." With just a little care you'll do it right every time and save a lot of communication problems.

7. REPAIR OF THREADED SURFACES. Before attempting to repair a threaded surface, we must know the pitch of the thread.

a. Pitch Gage. If the pitch of a thread is not known, it can be determined by comparing it with standards on a pitch gage.

(1) Place a blade of the gage over the threads and see whether it meshes; if not, successively check each blade of the gage against the thread until it meshes.

(2) The pitch can then be read off the correct blade. The blades are pointed so they can be inserted in small nuts to check the inside threads as well as outside threads.

b. Thread Restorer File. When external threads have been damaged, they may be repaired with a thread restorer file.

(1) Select a thread file that has the same number of teeth as the threaded surface you want to repair.

(2) Place the cutting teeth of the file parallel to the threads that require repairing.

(3) Holding the thread file firmly, the cutting action will follow the threads and restore the damaged section.

c. Screw Extractor. To remove broken screws without damaging the threads or surrounding material the mechanic uses a screw extractor.

(1) Drill a hole in the broken screw slightly smaller than the diameter of the extractor. When drilling larger screws it may be necessary to drill a small pilot hole first, then a large hole.

(2) Insert the extractor in the drilled hole and remove the broken screw by turning the extractor counterclockwise using a tap wrench or open end wrench.

d. Taps. The tap is used to restore or cut internal threads in metal, plastics or hard rubber.

(1) Taps are marked according to the type and diameter they will cut. For example, an 8-32 is designed to cut 32 threads per inch on No. 8 stock.

(2) Select the correct size tap and secure it in the tap wrench.

(3) Place the tap in the hole and rotate clockwise for right hand threads.

(4) Do not force the tap; to do so would result in tool breakage and ruined threads.

(5) When threading, use a lubricant such as cutting oil and frequently reverse the direction of the cutting to free the tap of chips and also recut the threads.

(6) The tap is removed by turning in the opposite direction of threading.

e. Dies. To restore rounded or rusty threads on screws and bolts we use a die.

(1) Dies are marked in the same manner as the taps.

(2) Select the correct size die, assembling the die and die stock. Make sure the setscrew is tight to prevent the die from falling out of the diestock.

(3) Apply cutting oil to the die and work.

(4) Position the diestock over the work and tighten the thumbscrews.

(5) Rotate the diestock clockwise slowly but firmly, until the die takes hold.

(6) Turn the diestock one turn forward and one quarter turn backward. Repeat this procedure until the threads are restored or cut to the desired length.

f. Coil Thread Insert. When the internal threads of a component are stripped or damaged beyond repair, we install a coil thread, commonly referred to as a "helicoil."

(1) Before we can install the insert the stripped or damaged threads must be drilled out.

(2) Select the tap of the required nominal thread size. The tapping procedure is the same as standard thread tapping.

(3) After the tapping has been completed, clean out all metal chips.

(4) Adjust the stop collar on the mandrel, to insure proper depth of the insert installation, by positioning it so that is touches the tool body when the mandrel projects through the prewinder a distance equal to the nominal length of the insert plus 1/2 thread.

(5) Retract the mandrel by turning it counterclockwise.

(6) Place a finger lightly over the insert in the well while rotating the mandrel in a clockwise direction.

(7) This will prevent the insert from falling out of the tool while it is being guided onto the mandrel.

(8) Continue rotating the mandrel clockwise until the insert projects beyond the tip of the tool approximately one full thread.

(9) Place the tool squarely against the tapped hole in the work, hold firmly and rotate the mandrel clockwise until the stop collar just contacts the tool body.

(10) Retract the mandrel by rotating counterclockwise until it is free of the hole.

(11) The tang is snapped off clean by placing a punch in the installed insert contacting the tang at the bottom of the hole and striking the punch a sharp blow with a hammer.

REFERENCE:

Industrial Training, Inc., Sound Slide Program, "Threaded Fasteners"